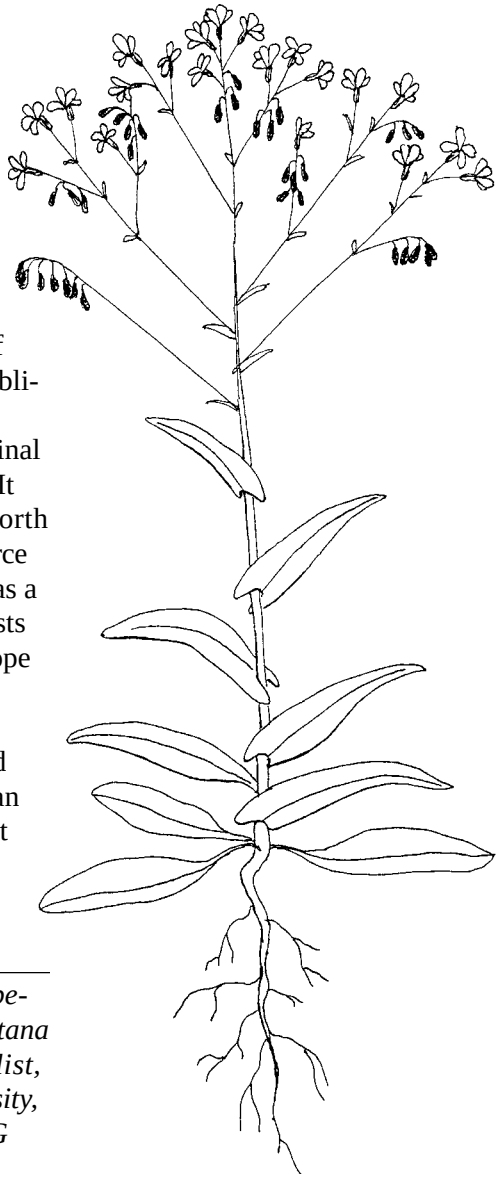
Dyer's Woad: A Threat to Rangeland in Montana

*by Susan Kedzie-Webb, Roger Sheley and Steve Dewey**

Dyer's woad (*Isatis tinctoria* L.) is a devastating noxious weed that has invaded pastures and rangeland throughout the intermountain west. This exotic weed is a potential threat to Montana rangelands. Dyer's woad displaces native rangeland species and has been observed to reduce forage carrying capacity by an average of 38 percent. Dyer's woad frequently invades dry, rocky soils on rugged terrain making control difficult. Currently, several small infestations occur in Montana. Our objective is to keep dyer's woad from becoming a major noxious weed problem in Montana.

Dyer's woad was first reported in Montana in the 1950s. Since then, infestations have become established in south-central Missoula County, Silver Bow County, southern Beaverhead County and central Park County (Figure 1, next page). The spread of these initial infestations has been controlled through intensive hand pulling efforts. Infestations were present in Gallatin County (West Yellowstone), Pondera County (Conrad), northern Judith Basin County and west central Mussellshell County and have been eradicated. A single plant was pulled in Sweetgrass County in 2000.



Dyer's woad, a member of the mustard family, is a native of southeastern Russia. Prior to Biblical references of "woad" as a weed, it was used for its medicinal properties and dying qualities. It was probably introduced to North America for cultivation as a source of blue indigo dye or possibly as a crop seed contaminant. It persists today as a weed in Africa, Europe and South America.

The westward spread of dyer's woad has been attributed to its use as a textile dye or as an ornamental by early pioneers. It appears to be especially well-adapted to the environmental and physical conditions of the

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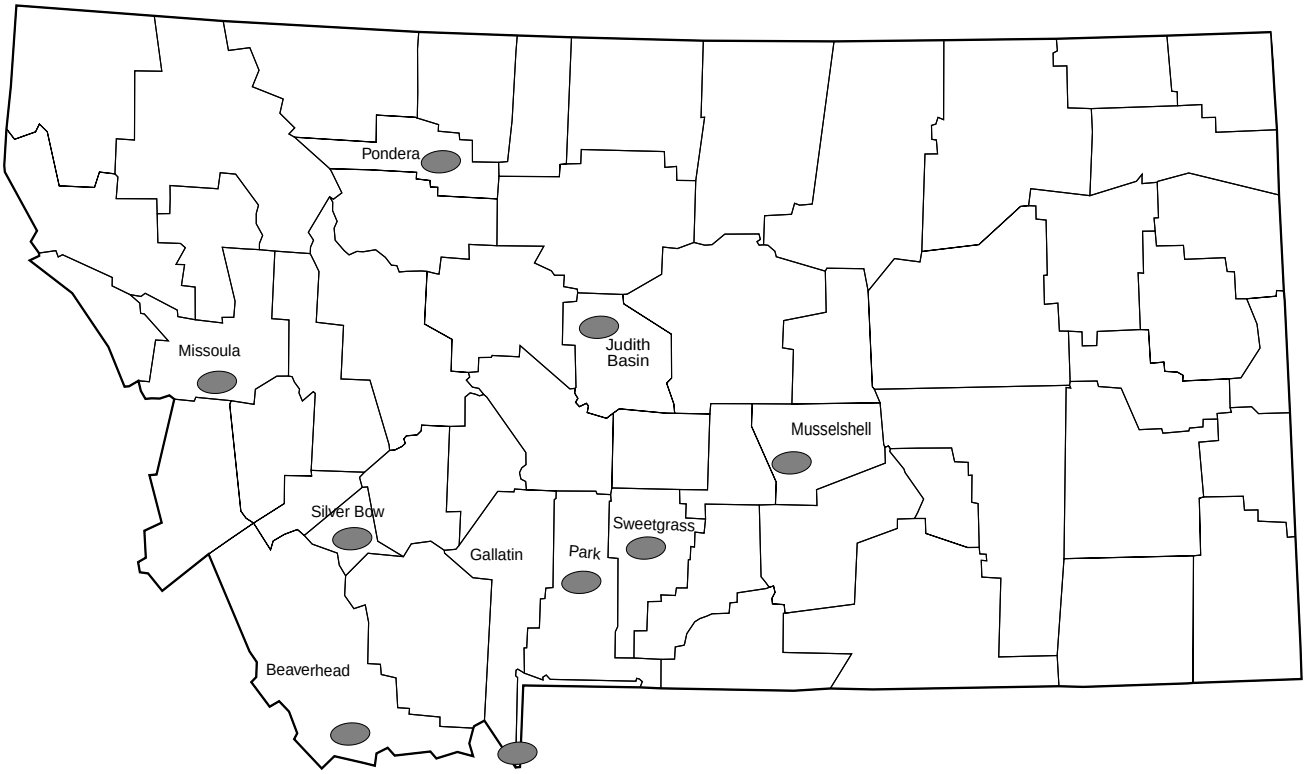

Figure 1. Sites where dyer's woad (Isatis tinctoria L.) has been collected in Montana.

intermountain west, since it has not escaped areas in the eastern United States, where it was cultivated for commercial use. Dyer's woad continues to be a problem on cropland, rangeland and wasteland in northwestern California, southeastern Oregon, Idaho, Montana, Wyoming and Utah. It currently infests 20 counties in the five northwestern states .

Dyer's woad, like other mustards, is highly competitive. It uses large amounts of nitrogen, phosphorus, potassium and water. Woad infestations often start on dry, gravely soil along roadsides, but soon invade range and cropland. Dispersal of dyer's woad along waterways occurs when seeds float downstream and become established on sandbars, gravel bars and riverbanks.

Growth Habit

Dyer's woad is classified as a biennial, although it occasionally grows as a summer annual. Seeds of dyer's woad germinate in the fall or spring to form rosettes. Rosette leaves have fine hairs and are widest near the leaf tip (Figure 2).

Dyer's woad is easily recognized in April and May when bright yellow flower clusters are present (Figure 3). Each flower has four petals and four sepals. Collectively, the flowers have a yellow-green appearance. Plants are blue-green in color and usually grow 2 to 4 feet high, successfully shading out their neighbors. Stem leaves are alternate, lance-shaped and slightly hairy. Lower leaves have a short petiole, while the upper leaves clasp the stalk. All leaves have a prominent cream colored mid-rib which extends from the base of the leaf to its tip (Figure 4). The large, branched taproot may reach more than 5 feet deep. Although the weed sometimes

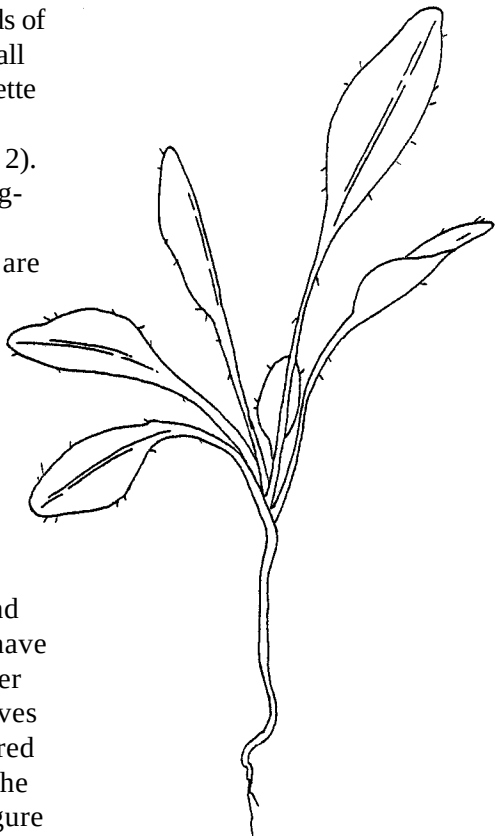

Figure 2. Rosette leaves with fine hairs and wide leaf tips.

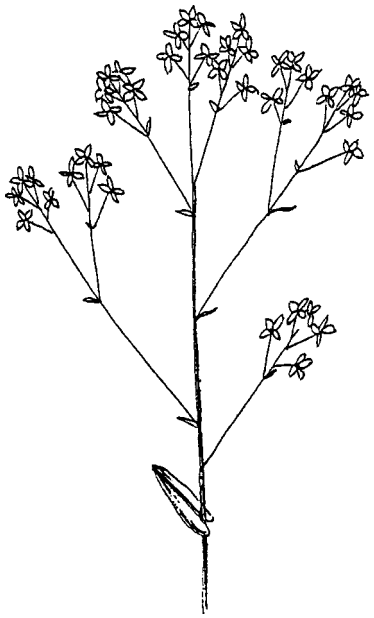

Figure 3. Flower clusters present from April to May.

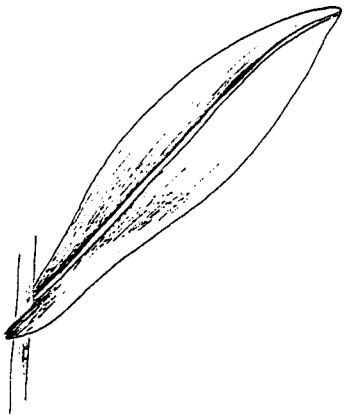

Figure 4. Prominent cream colored mid-rib extending from leaf to base.

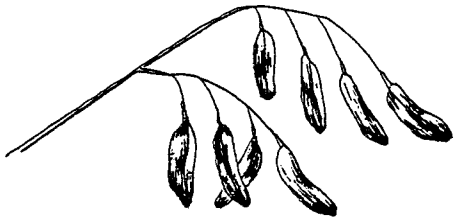

Figure 5. Wing shaped seed pods or fruits hang downward.

spreads from underground portions of the root system, it spreads mainly by seeds.

Fruits or seed pods are wing-shaped, 1/2 to 3/4 inch long and 1/4 inch wide (Figure 5). Each mature pod contains one brownish-yellow seed. Pods change from green to black or dark brown when mature. Fruits hang downward giving the plant an overall umbrella-like appearance. If you see a plant fitting this description, please contact your local county weed district or extension office.

Seed Germination

A chemical isolated from the seed pods of dyer's woad is known to effectively inhibit the germination of seeds from other plants as well as dyer's woad. Delayed germination of dyer's woad seed may enhance its survival by ensuring a future seed source. Therefore, it is important that when plants are found they are not allowed to produce seeds. Dyer's woad also inhibits the growth of competing plants. Stunted root growth is especially evident in other mustard species and further aids dyer's woad establishment. Together, these characteristics allow dyer's woad to successfully displace native vegetation.

Controlling Dyer's Woad

In Montana, our goal is to contain dyer's woad, reducing existing large infestations and eradicating all small infestations. Control of dyer's woad can be accomplished through manual, mechanical or chemical means. Hand pulling is the most effective method of controlling small infestations. Plants should be pulled at least twice per year: once at the beginning of May when flowers start to bloom and once 2–3 weeks later to eliminate any remaining plants. Eradication of dyer's woad will require persistent and intensive monitoring from year to year. Since dispersal is solely dependent on seed production, it is important to carry flowering plants out of the area because they may continue to produce seeds even after they are pulled.

For controlling large infestations, metsulfuron (Ally® or Escort®) at 1/2 oz. per acre with a non-ionic surfactant can be used to minimize seed production. This treatment provides about two seasons of control. Ally® and Escort® may also be used in combination with 2,4-D amine (4 pounds per gallon). A spring application is recommended when flowers are in pre-bloom (bud stage) or early bloom. Seed production can be greatly reduced, but not totally prevented, with a late application of Ally® or Escort® after fruits have begun to form. Metsulfuron should not be applied to open water, nor while water is present in wetlands. It is permissible to treat seasonally dry flood plains, marshes, swamps and transitional areas

Chlorsulfuron, sold under the trade name Telar®, is only suggested as a control measure on right-of-ways and in crops. It is not registered for rangeland use. Picloram (Tordon 22K®) and dicamba (Banvel®) provide relatively poor control of dyer's woad.

None of the herbicides mentioned have been found to be cost effective for controlling large infestations on rangeland. Cost effective control of large infestations with herbicides depends on the value of the rangeland. Therefore, early detection and treatment of new invasions is most critical.

Biological Control

The native rust pathogen, *Puccinia thlaspeos* stunts growth and can minimize seed production of dyer's woad. However, this rust is not widespread and may not reach many infestations. Currently, research is being conducted to evaluate the possibility of direct application of rust spores for biological control.

Sheep grazing may also provide limited control of dyer's woad. Sheep readily consume top growth of woad until the flowering stage. Recent studies suggest that properly timed grazing, repeated several times per season may increase mortality and reduce reproductive performance when at least 60 percent of the plant is removed. Biological controls alone will not eradicate dyer's woad but may provide some control.

Conclusions

Early recognition and immediate treatment are the most important means of controlling dyer's woad. Awareness is the best defense against future infestations. The Dyer's Woad Awareness and Eradication Program was initiated by MSU in cooperation with the Montana Department of Agriculture to prevent further invasion of dyer's woad. If you suspect you have discovered dyer's woad or would like more information, please contact the Rangeland Noxious Weed Specialist; Plant, Soil and Environmental Sciences Department, Montana State University, Bozeman, MT.

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